

Waste Characterization Workshop

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Opening Remarks

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Recycling

- Measurement
- Access
- Education & Outreach
- Market Development
- Best Practices



Solid Waste and Sustainability Advisory Panel

- Promote Policy
- Holistic
- Reduce Overlap
- Clarify



Compliance Assistance



Workshop Agenda

Hazardous Waste Characterization

Liquid Industrial Waste

Example Exercise

Networking Lunch

Solid Waste Characterization

Facilitated Waste Characterization Breakout

Product Substitution Stories and Tips

Landfill Waste Acceptance

**Break
10:30**

**Break
3:00**



Primary Workshop Goal

**Provide practical tools and
regulatory background to assist in performing site
specific waste characterizations consistent with
Michigan's regulations**



Workshop Reference Book

Michigan Department of Environment and Natural Resources

Waste Characterization Reference

Resources for characterizing
liquid industrial waste



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Chapter 7 - Subpart CC

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Workshop Outline and Example Exercise

Waste Characterization Workshop

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Waste Characterization Reference Book – Table of Contents

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Workshop Agenda

- Hazardous Waste Characterization
- Liquid Industrial Waste
- Solid Waste Characterization
- Facilitated Waste Characterization Breakout
- Product Substitution Stories and Tips
- Landfill Waste Acceptance

DEQ Highlights

- Generator:
 - Responsible for characterization
 - Most familiar with waste and changes
 - Must coordinate with purchasing and disposal
- Michigan:
 - Implements Part 111 regulations, not RCRA
 - Not adopted EPA Definition of Solid Waste materials
 - Not adopted EPA disposable wipes rule
 - DSW and disposable wipes will expect

Hazardous Waste Characterization

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The Common Question

- "Is my waste a hazardous waste regulated under RCRA?"
- Hazardous Waste Determination
 - Rule 302 (40 CFR 262.11)
 - "A person who generates a waste as described in this rule..."

Waste Characterization Examples

Example 1

Non-empty aerosol brake cleaner cans that have a Safety Data Sheet (SDS) identifying the following constituents:

Constituent	CAS Number	% by Wt.
Acetone	67-64-1	45 – 55
Toluene	108-88-3	25 – 35
Methanol	67-56-1	10 – 20
Carbon dioxide	124-38-9	5 – 10

The point of generation is when the aerosol can is to be discarded. The aerosol can is empty when the pressure within the can is at or approaching atmospheric pressure, it is not clogged and there are no audible liquids to be heard when shaken.

Listed Review

1. Is this an unused raw material commercial chemical product containing a sole active ingredient? NO
If Yes: Is there a SDS available? NA

2. Does the waste contain spent solvents or is it a wastewater treatment waste not discharged directly to the wastewater treatment plant pursuant to a permit issued by the treatment authority? No, the waste solvent was not used.

If Yes: Does the spent solvent or wastewater treatment waste meet a listing definition found in Part 111 Table 203? NA

Does the solvent blend before use contain:

- Only a F003 listed solvent? NA
- A F003 listed solvent and 10% or more by volume of any F001, F002, F004, or F005 listed solvents? NA
- 10% or more by volume of a F001, F002, F004, or F005 listed solvents before use? NA

If YES = Waste is a listed hazardous waste, advance to listed waste exclusion review.

3. Does the process generating the waste make the waste a hazardous waste, by definition because the process waste is listed in Part 111 Table 204a (K listed)? NO

Listed Waste Exclusion Review – NA

4. Does the waste exhibit a characteristic that makes it a characteristic hazardous waste?
 - ✓ Ignitable – YES, WASTE IS D001
 - ✓ Toxic – NO See Page 2-26 and 1-27 (Table 201a)
 - ✓ Corrosive – NO
 - ✓ Reactive – NO

Most aerosols are ignitable or toxic, but some contain products that are reactive or corrosive. Be sure to check if the contents is corrosive (D002) or reactive (D003).

- Characteristic Waste Exclusion Review - NONE – Manage as a D001 hazardous waste.
Also apply the D003 reactive hazardous waste code if the aerosol is capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement.

LDR Review

If generated by a SQG or LQG, the LDRs apply and notification is required. This is a nonwastewater, the treatment is "DEACT," and the UHCs include ACETONE, TOLUENE, and METHANOL. See Pages 4-4, 4-13, and 4-15.

Liquid Industrial Waste and Solid Waste Review – SKIP for a hazardous waste.

DEQ Highlights

(Rule 302)

Generator:

- responsible for characterization
- most familiar with waste and changes
- must coordinate with disposal facility



DEQ Highlights

Michigan:

- Implements Part 111 regulations, not RCRA
- Not adopted EPA DSW changes establishing RCRA hazardous secondary materials
- Not adopted EPA disposable wipes rule

DEQ Highlights

New EPA Pre-FR Publication of Proposed Rulemaking on 8/31/15:

- **Proposed New Management Standards for Hazardous Waste Pharmaceuticals**
- **Proposed New Hazardous Waste Generator Improvements Rule**

DEQ Highlights

Part 121 Statutory Changes:

- **Proposed Senate Bill 400**
- **Eliminate manifests**
- **Require shipment record**
- **Define liquid industrial byproduct**
- **Hearings scheduled when legislature reconvenes session**

Today's Morning Presenters

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Drug and Laboratory Disposal

Kerry Puzio

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Waste Characterization Workshop

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The Common Question

“Is my waste a hazardous waste regulated under Part 111 of Act 451 and the corresponding provisions under Resource Conservation and Recovery Act (RCRA)?”



Hazardous Waste Determination

Rule 302 (40 CFR 262.11)

“A person who generates a waste as defined in R 299.9202 shall determine if that waste is a hazardous waste...”

How do you determine if your waste is a hazardous waste?



Hazardous Waste Determination

Answer the following:

- Is the waste **excluded** (full or partial)?

See Rule 204, 205, 207, 228, 206, 231, 831, and 40 CFR 261.4

- Is the waste **listed**?

See Rules 213, 214, and 40 CFR 261.30

- Is the waste a **characteristic** waste?

See Rule 212 and 40 CFR 261.20



What is a Solid Waste?

Rule 202 (40 CFR 261.2)

“A solid waste is any discarded material that is not excluded under Rule 204 (40 CFR 261.4(a))...”

A solid waste includes solids, liquids, semisolids, or gaseous materials

See Page 1-1



What Is a Discarded Material?

Any material which is:

- **Abandoned**
- **Recycled**
- **Considered inherently waste-like**
- **A military munition**



Abandoned Material

Materials are abandoned by being:

- **Disposed; or**
- **Burned or incinerated; or**
- **Accumulated, stored, or treated before being disposed of, burned, or incinerated**

Point of Origination

When waste first becomes subject to waste regulation

Per Rule 203(2) this is when:

- **It first meets a listing in Rule 213 or 214 OR**
- **It is mixed with listed hazardous waste or severely toxic hazardous waste OR**
- **It first exhibits a characteristic in Rule 212**

See Page 1-5



Hazardous Waste Determination

Answer the following:

- Is the waste **excluded** (full or partial)?

See Rule 204, 205, 207, 228, 206, 231, 831, and 40 CFR 261.4

- Is the waste **listed**?

See Rules 213, 214, and 40 CFR 261.30

- Is the waste a **characteristic** waste?

See Rule 212 and 40 CFR 261.20



Is the Waste Excluded?

Three possible ways:

- It is excluded from the definition of a *solid waste*
- It is excluded from the definition of a *hazardous waste*
- It is partially excluded and must be managed to meet a special rule (e.g. universal waste, recyclable material, CRT Rule or precious metals)

Solid Waste Exclusions

Rule 204(1) (40 CFR 261.4(a))

Common exclusions include:

- POTW approved discharges (Rule 204(1)(b))
- Secondary materials reclaimed and returned to original process (Rule 204(1)(h))
- Scrap Metal (Rule 204(1)(p))
- Shredded circuit boards (Rule 204(1)(a))
- Comparable fuels (Rule 204(1)(w))
- CRTs (Rule 204(1)(z))

See Page 1-7



Hazardous Waste Exclusions

Rule 204(2) & (3) (40 CFR 261.4(b))

Common exclusions include:

- Household waste, including sanitary waste from hotels, motels, bunkhouses, campgrounds etc. (Rule 204(2)(a))
- Agricultural waste (Rule 204(2)(b))
- Mining overburden (Rule 204(2)(c))
- Petroleum contaminated media from an approved UST clean-up (Rule 204(2)(l))
- Materials in product tank in use (Rule 204(3)(a))

See Pages 1-12 and 1-15



Is Waste a Listed Hazardous Waste?

Rules 213 and 214 (40 CFR 261.30)

Listings are a narrative description of a specific type of waste

Only the knowledge of the process that generated the waste is needed to determine if the waste is listed

See Page 1-23 and 1-24



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EPA Criteria for Listing

Criteria include:

- Toxic listed wastes
- Acutely hazardous wastes
- Characteristic wastes

Listed Hazardous Waste Hazard Codes

Toxic Waste = (T)

Acute Hazardous Waste = (H)

Ignitable Waste = (I)

Corrosive Waste = (C)

Reactive Waste = (R)

Toxicity Characteristic Waste = (E)

See Pages 1-26 to 1-68



Four Types of Listed Hazardous Waste Codes

“F-Listed” Codes

“K-Listed” Codes

“P-Listed” Codes

“U-Listed” Codes



“F-Listed” Waste Codes

Rule 213(1)(a)Table 203a (40 CFR 261.31)

Includes hazardous wastes from non-specific sources

Hazardous waste codes F001 – F039

Seven manufacturing or industrial processes create the categories of F-Listed wastes

See Page 1-28



“F-Listed” Categories

Spent solvent wastes (F001 - F005)

**Electroplating and other metal finishing operations
(F006 - F012 and F019)**

**Dioxin-bearing waste (F020 – F023 and F026 –
F028)**



“F-Listed” Categories

Wastes from the production of certain chlorinated aliphatic hydrocarbons (F024 and F025)

Wastes from wood preserving (F032, F034, and F035)



“F-Listed” Categories

**Petroleum refinery wastewater treatment sludges
(F037 and F038)**

Multisource leachate (F039)



Spent Solvent Wastes

Includes 31 specific halogenated and nonhalogenated organic solvents

The organic solvent must be spent and must have been used for its “solvent properties”

Includes the still bottoms from the recovery of these spent solvents

Spent Solvent Wastes

F001 - Spent halogenated solvents used in degreasing

F002 - Spent halogenated solvents

F003 to F005 - Spent nonhalogenated solvents



Spent Solvent Wastes

F001, F002, F004, and F005 Spent Solvents include...

Mixtures and blends containing, before use, a total of 10% or more by volume of one or more of any of the solvents listed in F001, F002, F004, or F005.



Spent Solvent Wastes

F003 spent solvents include...

- **Mixtures and blends containing, before use, only the solvents listed in F003.**
- **Mixtures and blends containing, before use, one or more of the solvents listed in F003 and a total of 10% or more by volume of one or more of any of the solvents listed in F001, F002, F004, and F005.**

Spent Solvent Wastes

Key information and knowledge

- “Spent” and “solvent properties”
- Names of the solvents
- Before use concentration for each of the solvents
- 10% or more concentration
- Aggregate of one or more of the solvents

Example #1

Before use concentration mixture:

- **5% Methylene Chloride (F002)**
- **3% Nitrobenzene (F004)**
- **2% Toluene (F005)**
- **90% Water**

Spent solvent is F002, F004, and F005

Example #2

Before-use concentration mixture:

- **5% Tetrachloroethylene (F002)**
- **3% Acetone (F003)**
- **7% Isobutanol (F005)**
- **85% Water**

Spent Solvent is F002, F003, and F005

Example #3

Before-use concentration mixture:

- **3% Tetrachloroethylene (F002)**
- **3% Acetone (F003)**
- **3% Isobutanol (F005)**
- **91% Water**

Spent solvent is not a listed spent solvent.

“K-Listed” Waste Codes

Rule 213(1)(b), Table 204a (40 CFR 261.32)

Includes hazardous wastes from specific sources

More than 100 K-Listed waste codes

Detailed descriptions of wastes generated from specific industries

See Pages 1-33 to 1-44



“K-Listed” Waste Codes

Two primary questions to ask:

Is the facility listed as one of the industries that generate K-Listed wastes?

Does the waste match one of the specific K-List waste descriptions?



“K-Listed” Waste Codes

Thirteen industries generate K-Listed wastes:

- Wood Preservation
- Inorganic Pigments
- Organic Chemicals
- Inorganic Chemicals
- Pesticides
- Explosives
- Petroleum Refining
- Iron and Steel
- Primary Aluminum
- Secondary Lead
- Veterinary Pharmaceuticals
- Ink Formulation
- Coking

“K-Listed” Waste Codes

K005 - Wastewater treatment sludge from the production of chrome green pigments

K101 - Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds

Discarded Commercial Chemical Products

Rule 214, Tables 205a, 205b, 205c (40 CFR 261.33)

Includes discarded commercial chemical products, off-specification products, container and spill residues

Listed product not meeting customer specifications or contaminated with another material, requiring disposal

See Pages 1-44 to 1-68



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Discarded Commercial Chemical Products

Designated as hazardous wastes when discarded or intended to be discarded

Includes commercial chemicals with listed material as sole “active” ingredient, not all materials containing listed commercial chemical product



Discarded Commercial Chemical Products

**Commercial chemical product or
manufacturing chemical intermediate**

Commercially pure grade of chemical

Technical grade of chemical

Sole active ingredient



Discarded Commercial Chemical Products

Three lists of generic chemical names:

- Table 205a (40 CFR 261.33(e))

P-Listed waste - **ALL acutely hazardous!**

- Tables 205 b (federal) (40 CFR 261.33(f))

U-Listed wastes (federal)

- Table 205c (state)

U-Listed wastes (Michigan only)

Match CAS to ensure accurate match



Discarded Commercial Chemical Products

Includes all commercial chemical products and manufacturing chemical intermediates having one of the generic chemical names

Includes off-specification products

Includes residues and spill cleanup debris



Discarded Commercial Chemical Products

The P-listing and U-Listings only applies to unused and discarded commercial chemical products with a solve active ingredient



Characteristic Hazardous Waste

Waste that exhibits properties that can cause death or injury to humans or lead to ecological damage

Characteristics are detectable using a standardized test method or by applying general knowledge of the waste properties

Four Characteristics

- Ignitability (D001)
- Corrosivity (D002)
- Reactivity (D003)
- Toxicity (D004 – D043)

Plus Michigan's Severely Toxic (001S – 007S)



Ignitability D001 Characteristic

Rule 212(1)(a) (40 CFR 261.21)

Wastes that can readily catch fire and sustain combustion

Includes both liquids and non-liquids

See Page 1-22



Four Properties of Ignitability

1. **Liquids, other than an aqueous solution containing less than 24% alcohol by volume, with a flash point $<140^{\circ}$ F**
 - **Aqueous: $\geq 50\%$ water by weight**
 - **Alcohol exclusion: $<24\%$ by volume**
 - **Flash point test: ASTM standard**

Four Properties of Ignitability

2. **Non-Liquids that can spontaneously catch fire and burn vigorously and persistently**
3. **Ignitable compressed gases (DOT regulations)**
4. **Oxidizers (DOT regulations)**

Corrosivity D002 Characteristic

Rule 212(2) (40 CFR 261.22)

Wastes that are highly acidic or highly basic

Wastes that can readily corrode or dissolve flesh, metal, or other materials

Two Properties of Corrosivity

Aqueous waste with $\text{pH} \leq 2$ or ≥ 12.5

Liquids that corrode steel at a rate of greater than 0.25 inches per year

Test if waste contains sufficient water to perform pH test

Characteristic of corrosivity does not apply to a waste that is physically solid

Reactivity D003 Characteristic

Rule 212(3) (40 CFR 261.23)

Wastes that readily explode or undergo violent reactions or react to release toxic gases or fumes

Narrative criteria to define a reactive waste

See Page 1-22



Eight Properties of Reactivity

1. **Normally unstable and undergoes violent change without detonating**
2. **Reacts violently with water**
3. **Forms potentially explosive mixtures with water**

Eight Properties of Reactivity

4. **Produces toxic gases, vapors, or fumes when mixed with water**
5. **Cyanide- or Sulfide-bearing waste that releases toxic gases when exposed to pH conditions between 2 and 12.5**
6. **Is a forbidden DOT explosive**

Eight Properties of Reactivity

7. Capable of detonation or explosive reaction if subjected to a strong initiating force or if heated under confinement
8. Is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure

Toxicity Characteristic

Rule 212(4) (40 CFR 261.24)

D004 – D043 Waste Codes

EPA identified 40 toxic compounds and elements known to have leached into the groundwater after being disposed of in landfills

See Page 1-23



Toxicity Characteristic

Eight elemental metals (D004-D011)

Eight pesticides and herbicides (D012-D017, D020, and D031)

Twenty-four nonhalogenated and halogenated organic compounds (D018, D019, D021-D030, and D032-D043)

See Page 1-26



Toxicity Characteristic

EPA designed a laboratory procedure to replicate the leaching process that occurs when wastes are buried in a landfill

EPA established threshold regulatory levels for each toxic compound and element



EPA Designated Laboratory Procedure

Toxicity Characteristic Leaching Procedure (TCLP)

- Reduce the size of the waste by grinding
- Add an acid to the grindings to create a leachate
- Analyze the leachate and determine the concentration levels
- Evaluate the concentration levels against the regulatory levels

20 Times Rule

TCLP allows use of total constituent analysis in lieu of TCLP for solids

For solid sample, divide total results by 20 and compare to TCLP limit in Table 201a

For semi-solid, see EPA formula in reference book

See Page 6-1



Mixture Rule

Rule 203(1)(c) (40 CFR 261.3(a)(2)(iv))

Any mixture consisting of a listed hazardous waste (F-, K-, U-, and P-Listed) and any other solid waste is still considered to be hazardous waste

See Page 1-22



Derived From Rule

Rule 203(3) (40 CFR 261.3(c)(2)(i))

Any waste generated from the treatment, storage, or disposal of a hazardous waste is also a hazardous waste

See Page 1-5



Land Disposal Restrictions (LDR)

Rule 311 (40 CFR 268)

Requires treatment of hazardous waste prior to disposal

Minimize the long-term threat posed to human health and the environment

See Page 4-1



Responsibilities

Identify the hazardous waste codes for each waste

Determine the treatment standards for each waste code

Identify any underlying hazardous constituents (UHC)



Review Hazardous Waste Codes

Hazardous only due to listed waste codes (F, K, P, and U)

Hazardous only due to characteristic waste Codes (D)

Hazardous due to both listed and characteristic waste codes

Determine the LDR Treatment Standards

Treatment standards for hazardous wastes in 40 CFR 268.40 table

Listed by hazardous waste code

Standards for wastewaters and nonwastewaters forms of each hazardous waste

***See Pages 4-4 to 4-12
(D001 to F019 codes only)***



Wastewater vs Nonwastewater

Wastewater - Waste containing $<1\%$ by weight total organic carbon (TOC) and $<1\%$ by weight of total suspended solids (TSS)

Nonwastewater – Aren't wastewaters or waste containing $\geq 1\%$ by weight total organic carbon (TOC) and $\geq 1\%$ by weight of total suspended solids (TSS)

What Are the Treatment Standards?

Three types of treatment standards:

- Total Concentration (mg/kg)
- TCLP Results (mg/l TCLP)
- Technology Standards (letter codes)

See Page 4-10



What Are the Treatment Standards?

TREATMENT STANDARDS FOR HAZARDOUS WASTES—Continued

[Note: NA means not applicable]

Waste code	Waste description and treatment/Regulatory subcategory ¹	Regulated hazardous constituent		Waste waters	Nonwastewaters
		Common name	CAS ² number	Concentration ³ in mg/L; or Technology Code ⁴	Concentration ⁵ in mg/kg unless noted as *mg/L TCLP ⁶ ; or Technology Code ⁴
D039 ⁹	Wastes that are TC for Tetrachloroethylene based on the TCLP in SW846 Method 1311.	Tetrachloroethylene	127-18-4	0.056 and meet §268.48 standards ⁹	6.0 and meet §268.48 standards ⁹
D040 ⁹	Wastes that are TC for Trichloroethylene based on the TCLP in SW846 Method 1311.	Trichloroethylene	79-01-6	0.054 and meet §268.48 standards ⁹	6.0 and meet §268.48 standards ⁹
D041 ⁹	Wastes that are TC for 2,4,5-Trichlorophenol based on the TCLP in SW846 Method 1311.	2,4,5-Trichlorophenol	95-95-4	0.18 and meet §268.48 standards ⁹	7.4 and meet §268.48 standards ⁹
D042 ⁹	Wastes that are TC for 2,4,6-Trichlorophenol based on the TCLP in SW846 Method 1311.	2,4,6-Trichlorophenol	88-06-2	0.035 and meet §268.48 standards ⁹	7.4 and meet §268.48 standards ⁹
D043 ⁹	Wastes that are TC for Vinyl chloride based on the TCLP in SW846 Method 1311.	Vinyl chloride	75-01-4	0.27 and meet §268.48 standards ⁹	6.0 and meet §268.48 standards ⁹
F001, F002, F003, F004, & F005	F001, F002, F003, F004 and/or F005 solvent wastes that contain any combination of one or more of the following spent solvents: acetone, benzene, n-butyl alcohol, carbon disulfide, carbon tetrachloride, chlorinated fluorocarbons, chlorobenzene, o-cresol, m-cresol, p-cresol, cyclohexanone, o-dichlorobenzene, 2-ethoxyethanol, ethyl acetate, ethyl benzene, ethyl ether, isobutyl alcohol, methanol, methylene chloride, methyl ethyl ketone, methyl isobutyl ketone, nitrobenzene, 2-nitropropane, pyridine, tetrachloroethylene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,2-trichloro-1,2,2-trifluoroethane, trichloroethylene, trichlorofluoromethane, and/or xylenes [except as specifically noted in other subcategories]. See further details of these listings in § 261.31.	Acetone Benzene n-Butyl alcohol Carbon disulfide Carbon tetrachloride Chlorobenzene o-Cresol m-Cresol (difficult to distinguish from p-cresol) p-Cresol (difficult to distinguish from m-cresol) Cresol-mixed isomers (Cresylic acid) (sum of o-, m-, and p-cresol concentrations) Cyclohexanone o-Dichlorobenzene Ethyl acetate Ethyl benzene Ethyl ether	67-64-1 71-43-2 71-36-3 75-15-0 56-23-5 108-90-7 95-48-7 108-39-4 106-44-5 1319-77-3 108-94-1 95-50-1 141-78-6 100-41-4 60-29-7	0.28 0.14 5.6 3.8 0.057 0.057 0.11 0.77 0.77 0.88 0.36 0.088 0.34 0.057 0.12	160 10 2.6 NA 6.0 6.0 5.6 5.6 5.6 11.2 NA 6.0 33 10 160

Technology Standards

40 CFR 268.42 provides treatment code key

Treatment standards that require a specific treatment technology

Expressed as a five-letter code like:

- **INCIN = Incineration**
- **NEUTR = Neutralization**

See Page 4-13



Underlying Hazardous Constituents (UHCs)

Listed in the universal treatment standards in 40 CFR 268.48 table

Applicable to all wastes that carry a characteristic hazardous waste code (D-Codes)

The UHCs are not what causes the waste to exhibit a characteristic

See Pages 4-15 to 4-23



Definition of UHCs

40 CFR 268.2(i)

Any constituent listed in the Universal Treatment Standard table found in 40 CFR 268.48 which can reasonably be expected to be present at the point of generation of the hazardous waste at concentrations above the constituent specific treatment standards

See Page 4-16



Questions to Ask About Waste with UHCs

Does the waste carry a characteristic hazardous waste code (D-Code)?

Does the treatment standard for the D-Code at the 40 CFR 268.40 table specify “and meet 268.48 standards”?

Are the concentrations of the UHCs “reasonably expected” to be above the treated standard levels?



LDR Notifications

40 CFR 268.7

LQGs and SQGs must determine if the waste requires treatment before land disposal

LQGs and SQGs must provide notice of LDR information for the initial waste shipment to each off-site TSD



LDR Notifications

LDR notification must include:

- **Manifest document number**
- **EPA hazardous waste numbers**
- **Treatment standards**

There is no standard EPA notification form for the LDR notice

See Page 4-24 to 4-27



DENSO



Hazardous Waste Determination

Who is responsible?

Completion of waste surveys and waste characterizations

Analytical testing versus generator knowledge



Representative Waste Sampling

What is a “Representative Sample?”

40 CFR 260.10 – EPA definitions

“A sample of a universe or whole which can be expected to exhibit the average properties of the universe or whole”

How to Obtain a Representative Sample

Use EPA-approved sampling protocols

40 CFR 261, Appendix I

Methods and equipment vary based on the form and consistency of the waste

ASTM standards



What is Being Sampled?

Extremely viscous liquids

Crushed or powdered materials

Containerized liquid waste

Liquid wastes in pits, ponds, lagoons, and similar reservoirs

Subpart CC

**Generally requires sampling to verify LQGs are
< 500 ppmv and not subject**

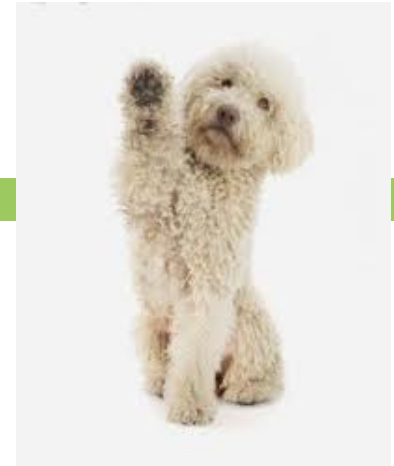
**Only simple processes using 1 or 2 volatile organic
products in consistent ratios can use calculations to
determine ppmv**

**See reference book for calculations and testing
details**

See page 7-1



Questions?



Waste Characterization Workshop

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Technical Definition of Liquid Industrial Waste

Per Part 121, MCL 324.12101(n)...

"Liquid industrial waste" means any brine, by-duct, industrial wastewater, leachate, off-specification commercial chemical product, sludge, sanitary sewer clean-out residue, storm sewer clean-out residue, grease trap clean-out residue, spill residue, used oil, or other liquid waste that is produced by, is incident to, or results from industrial, commercial, or governmental activity or any other activity or enterprise **determined to be liquid by method 9095 (paint filter liquids test) ...**

See Page 1-71



Technical Definition of Liquid Industrial Waste

Per Part 121, MCL 324.12101(n), liquid industrial waste does not include:

- **Hazardous waste regulated and required to be manifested under part 111**
- **Septage waste regulated under part 117**
- **Medical waste regulated under part 138 of the public health code...**

Technical Definition of Liquid Industrial Waste

Per Part 121, MCL 324.12101(n), liquid industrial waste does not include:

- **A discharge to the waters of the state in accordance with a permit, order, or rule under part 31**
- **A liquid generated by a household**
- **A liquid regulated under 1982 PA 239, MCL 287.651 to 287.683 (vegetable and animal fats managed under Bodies of Dead Animals Act)**

Technical Definition of Liquid Industrial Waste

Per Part 121, MCL 324.12102a, the following are not liquid industrial wastes when managed as specified:

- **A liquid fully contained inside a manufactured article, until the liquid is removed or the manufactured equipment is discarded...**
- **An off-specification fuel, including a gasoline blendstock when....**

Technical Definition of Liquid Industrial Waste

Per Part 121, MCL 324.12102a, the following are not liquid industrial wastes when managed as specified:

- **A material that is used or reused as an effective substitute...**
- **A used oil that is directly burned to recover energy or used to produce a fuel if all of the following requirements are met...**

Technical Definition of Liquid Industrial Waste

- Food processing residuals as defined in section 11503, or site-separated material or source-separated material approved by the department under part 115, that, to produce biogas, will be decomposed in a controlled manner under anaerobic conditions using a closed system that complies with part 55
- liquid or a sludge and associated liquid authorized to be applied to land under part 31 or 115

Simple Definition of Liquid Industrial Waste

Non-hazardous waste that contains free liquids, is a liquid industrial waste

- ✓ **Used oils and coolants**
- ✓ **Grease trap waste**
- ✓ **Catch basin waste**
- ✓ **Weak acidic or caustic cleaners**
- ✓ **Floor drains and sump waste**
- ✓ **Part 111 exempted liquids (CESQG, recycled gas, etc.)**
- ✓ **Food processing wastewaters**

Why Have a LIW Statute?

Michigan is one of a few states that have a separate law for non-hazardous liquid wastes

Most states regulate LIW under their solid waste regulations

Michigan's LIW law

- **Provides better tracking of waste**
- **Requires use of permitted/registered LIW transporter**
- **Has goal of protecting our fresh water Great Lakes**



Why Have a LIW Statute?

Per a well scholared waste inspector...

**“The state of Michigan lies
completely within the watershed
containing 20% of the world's
fresh water.”**

Hint: She’s works out of the Kalamazoo District Office!



CESQG

Exempt from certain hazardous waste regulations

Not exempt from LIW statute

- **Waste must still be managed by a notified LIW designated facility**
- **LIW must be hauled by a permitted and registered LIW transporter with spill insurance**

CESQG/LIW generator includes most residential dry cleaners



Used Oil - Topics

What is Used Oil

Oil Testing

Rebuttable Presumption

Chlorinated Parrafin

Specification Used Oil

PCB's



See Page 9-1

Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809

Under Part 111, used oil is “any oil which has been refined from crude oil, or any synthetic oil, which has been used and as a result of use, is contaminated with physical or chemical impurities” and includes:

- Used motor oils
- Used hydraulic oils
- Used transmission & brake fluids
- All synthetic oils
- Spent quench oils
- Spent gear oils
- Non-PCB transformer oils
- Oil-water mixtures if sufficient oil exists for recycling

Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809

Under Part 111, used oil does NOT include petroleum based products that were not designed to function as lubricating agents or other protective applications

Under Part 111, used oil does NOT include:

- Fuels (Gasoline, Diesel, Fuel Oils)
- PCB oils (subject to TSCA)
- Mineral spirits
- Certain test/calibration fluids
- Animal fat or vegetable based oil

Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809

Used oil is subject to waste regulation under Parts 111, 121, and 167 of the Michigan Natural Resource and Environmental Protection Act

Part 111 and 121 establish hazardous waste and liquid industrial management standards for the used oil

Part 167 requires that the used oil be recycled



Used Oil - Common Tests

Total Halogens - Used for testing used oils for chlorine, fluorine, bromine, etc. to determine if a “presumed” hazardous waste

Used oil test for halogens using SW-846 or equipment like “Chlor-D-Test”



Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809

Used oil generally does not include used oil containing > 1000 PPM halogens

Used oil with > 1000 PPM halogens is a presumed listed hazardous waste unless sufficient characterization data can be presented to “rebut the presumption” that the halogens are present from mixing used oil with a listed hazardous waste (chlorinated solvents)

See Page 1-5



Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809

“Rebutting the presumption” is complicated for transporters & processors accepting used oil from multiple sources and most will not accept used oil > 1000 PPM halogens

Total halogens are usually tested using SW 846 or using on-site testing equipment like “Chlor-D-Test”

See Page 12-2 #14



Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809

If used oil contains > 1000 PPM halogens, it is presumed to have been mixed with listed halogenated hazardous waste unless rebutted

Can also use knowledge of waste to characterize, if feasible, but adequate documentation is required

Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809

Transporter usually tests oil prior to pick-up to verify LIW regulatory status

Generators should request and maintain copies of relevant test on file



Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809)

If > 1000 PPM halogens present, additional, costly testing is required to “rebut” whether used oil was mixed with hazardous waste:

Analyze for all halogenated Appendix VIII constituent

If > 100 PPM used oil fails and must be managed as a hazardous waste

CONCLUSION: Do not mix used oil with other wastes to facilitate required recycling and avoid being required to manage the mixture as a hazardous waste

Rebuttable Presumption

EPA/DEQ has discretion in determining what concentration is a “significant concentration” prompting rebuttal

RCRA does not contain regulatory threshold for each halogenated hazardous constituent likely in used oil

Generally look for concentrations less than 100 ppm for common hazardous halogenated constituents per FR preamble

Used Oil

Part 111, Rules 109(p), 203(1)(e), and 809)

Chlorinated Paraffins:

Typically have a total organic halogen content of 4,000 ppm or more but can be recycled through a tolling agreement per Part 111, Rule 203(1)(e)(i)

Not as valuable as non-chlorinated used oil



Specification Used Oil

Heating Value	17,000 BTU/Lb.
Arsenic	< 5.0 ppm
Cadmium	< 2.0 ppm
Chromium	< 10 ppm
Lead	< 100 ppm
Sulfur	< 1.5 % Typical
Total Halogens	< 1,000 ppm
PCB	< 1 ppm

If > 1,000 ppm and < 4,000 ppm halogens, generator can rebut and manage as specification used oil

PCB's

**Polychlorinated biphenyls must be < 1 ppm
for specification used oil blending use**

**1 ppm is detection limit for PCBs in oil using
SW-846 Method 8082**

**Oil from certain sources or areas require
verification analysis**

Other Common LIW

- Milk/food processing waste
- Grease trap waste
- Investigation derived waste (IDW)
- Contaminated stormwater/groundwater

Milk/Food Processing Waste

Off-Specification Food Product

- SDS
- BOD content
- Anaerobic digestion – See 12-2, Item 17

Production Facility

- Production area sumps
- Contaminated with product

Consumer Quantities – Part 115, Rule 430(d)

- Only lawful if comparable to household waste

Grease Trap Waste

Restaurants and Commercial Kitchens

- Rendering pursuant to MDARD Bodies of Dead Animals Act
- Liquid industrial waste solidification and landfill
- Non-waste if follow 12102a(n) exclusion and solid waste on-farm anaerobic digestion memo

Investigation Derived Waste (IDW)

Common IDW:

- Drill Tailings
- Monitoring Well Purge Water
- Decontamination Water

Use investigation details to identify constituents of concern

Analyze samples for constituents of concern to determine handling/disposal requirements



Handling IDW

Presume hazardous waste pending analytical verification:

- Place in closed tanks/containers
- Labeled
- Protected from weather, fire, physical damage and vandals

Analytical Typically Done Simultaneously

See Page 8-1



Contaminated Ground/Storm Water

Characterize using historical data and testing

Petroleum contaminated media from an approved UST remediation that fail for D016 – D043 are excluded from hazardous waste regulation under Rule 204(2)(I)

The exclusion does not apply to an AST remediation



Contaminated Ground/Storm Water

Disposal options may include:

- **On-site pump and treat**
- **Discharge to local wastewater treatment**
- **Surface water or groundwater discharge permit**
- **Off-site disposal**

Storm water may require stormwater management plan

Questions?



Example Exercises



Example Exercises

**Refer to Page 2-1 and 2-1
And Waste Characterization Example Handout**



Example 1

Non-empty aerosol brake cleaner cans that have a Safety Data Sheet (SDS) identifying the following constituents:

Constituent	CAS Number	% by Wt.
Acetone	67-64-1	45 --55
Toluene	108-88-3	25 – 35
Methanol	67-56-1	10 – 20
Carbon dioxide	124-38-9	5 - 10

Non-empty aerosol brake cleaner

What is the point of origin?

Upon discard of each aerosol can

Is waste an unused raw material commercial chemical product with a sole active ingredient (P or U List)?

NO, it has multiple ingredients performing functions



Non-empty aerosol brake cleaner

Is waste a spent solvent or wastewater treatment waste (F-list)?

NO, it has not been used

Is the process and waste on the K-list?

NO, see Page 1-33

Non-empty aerosol brake cleaner

Is there a listed waste exclusion?

SKIP since waste is not a listed hazardous waste



Non-empty aerosol brake cleaner

Does waste exhibit a characteristic?

Ignitable –

YES, D001

Toxic –

NO, **see Page 1-26 & 1-27**

Non-empty aerosol brake cleaner

Does waste exhibit a characteristic?

Corrosive –

NO

Reactive –

NO

Assign the D003 reactive code if the aerosol is capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement

Non-empty aerosol brake cleaner

Is there a characteristic waste exclusion?

NO

Liquid Industrial Waste and Solid Waste Review?

SKIP, waste must be managed as a D001



Non-empty aerosol brake cleaner

LDR Review:

LDR notification is required for SQG and LQGs

Waste is a D001 non-wastewater requiring
“DEACT” **see Pages 4-4 and 4-13**

UHCs include Acetone, Methanol, and
Toluene **see Pages 4-15 to 4-22**

Example 2

Dirty solvent removed from a degreasing tank that has a Safety Data Sheet (SDS) identifying the following constituents:

Constituent	CAS Number	% by Wt.
Acetone	67-64-1	45 --55
Toluene	108-88-3	25 – 35
Methanol	67-56-1	10 – 20

Dirty solvent removed from a degreasing tank

What is the point of origin?

Upon removal from the tank

Is waste an unused raw material commercial chemical product with a sole active ingredient (P or U List)?

NO, it has multiple ingredients performing functions



Dirty solvent removed from a degreasing tank

Is waste a spent solvent or wastewater treatment waste (F-list)?

Yes, it is a solvent that has been used and can no longer be used for its original intended purpose

Dirty solvent removed from a degreasing tank

Does the spent solvent blend before use contain:

Only a F003 listed solvent? **See Page 1-28**

NO

Dirty solvent removed from a degreasing tank

Does the spent solvent blend before use contain:

A F003 listed solvent and 10% or more by volume of any F001, F002, F004, or F005 listed solvents?

YES, acetone (55%), methanol (20%) (both F003), and toluene (35%) (F005), so waste is a F003

Dirty solvent removed from a degreasing tank

Does the spent solvent blend before use contain:

10% or more by volume of a F001, F002, F004, or F005 listed solvents?

YES, toluene so waste is F005

Dirty solvent removed from a degreasing tank

Is the process and waste on the K-list?

NO, see Page 1-33

Dirty solvent removed from a degreasing tank

Is there a listed waste exclusion?

NO, manage as a F003 and F005 hazardous waste

Dirty solvent removed from a degreasing tank

Does waste exhibit a characteristic, is a liquid industrial waste or solid waste?

SKIP, Hazardous waste is F Listed and presumes the D001 code

Dirty solvent removed from a degreasing tank

LDR Review:

LDR notification is required for SQG and LQGs

Waste is a F003 and F005 non-wastewater requiring treatment to the levels specified.

See Pages 4-10 and 4-16

UHCs include is Acetone, Methanol, and Toluene **See Pages 4-15 to 4-22**

Example 3

Expired nicotine patches (smoking cessation aids) discarded because they cannot be lawfully administered to a patient or sold as a product.



Expired nicotine patches

What is the point of origin?

Upon determination the patches must be discarded

Is waste an unused raw material commercial chemical product with a sole active ingredient (P or U List)?

**YES, Nicotine & Nicotine Salts P075,
see Page 1-48**

Expired nicotine patches

Is waste a spent solvent or wastewater treatment waste (F-list)?

NO

Is the process and waste on the K-list?

NO



Expired nicotine patches

Is there a listed waste exclusion?

YES, pharmaceuticals used to treat, diagnose, prevent, or cure disease in humans or animals are eligible to be managed as a universal waste in Michigan.

Partial exclusion does not apply to R & D pharmaceuticals or e-cigarettes

Expired nicotine patches

Characteristic, Liquid Industrial Waste, and Solid Waste Review

SKIP for a listed hazardous waste. No characteristic codes are presumed for nicotine.



Example 4

Collected stormwater runoff and groundwater from a closed gas station underground storage tank farm removal.

Collected stormwater runoff and groundwater from UST Remediation

What is the point of origin?

Upon management of the media or when it is extracted or collected.

Is waste an unused raw material commercial chemical product with a sole active ingredient (P or U List)?

NO



Collected stormwater runoff and groundwater from UST Remediation

Is waste a spent solvent or wastewater treatment waste (F-list)?

NO

Is the process and waste on the K-list?

NO



Collected stormwater runoff and groundwater from UST Remediation

Is there a listed waste exclusion?

SKIP since waste is not a listed hazardous waste



Collected stormwater runoff and groundwater from UST Remediation

Does waste exhibit a characteristic?

Ignitable –

NO

Toxic –

YES for benzene D018, **see Page 1-26
and 1-27**

Collected stormwater runoff and groundwater from UST Remediation

Does waste exhibit a characteristic?

Corrosive –

NO

Reactive –

NO



Collected stormwater runoff and groundwater from UST Remediation

Is there a characteristic waste exclusion?

YES, Rule 204(2)(I) excludes petroleum contaminated media that fails the toxicity characteristic for hazardous waste numbers D018 through D043 only if the media is being remediated pursuant to an approved UST clean-up



Collected stormwater runoff and groundwater from UST Remediation

Does the waste pass through the paint filter (liquids break through the filter) and fails the paint filter test?

YES, waste is a liquid industrial waste



Collected stormwater runoff and groundwater from UST Remediation

Solid Waste Exclusions Review

SKIP, waste must be managed as a liquid industrial waste



Collected stormwater runoff and groundwater from UST Remediation

LDR Review:

LDR notification is NOT required

LDR notification is only required for hazardous waste from SQG and LQGs

Waste is a liquid industrial waste



Questions?

